Claims:

What is claimed is

1. A heterogeneous intersubband (HISB) optical device having a predetermined function, said device comprising

a multiplicity of stacked intersubband (ISB) sub-devices, characterized in that

at least two of said sub-devices have different individual gain/loss profiles, , and

said individual gain/loss profiles are mutually adapted to generate said predetermined function.

2. The invention of claim 1 wherein said sub-devices have a set of characteristic parameters including the peak energy of the ISB transitions therein, the position of each sub-device in the stack, the oscillator strengths of said transitions, the energy bandwidth of said transitions, the length of said sub-devices, and the doping levels of said sub-devices, said individual gain/loss profiles being determined by mutually adapting said parameters.

3. The invention of claim 1 wherein said HISB device is designed to operate in conjunction with a second device having a gain/loss characteristic over a particular wavelength range, said individual gain/loss profiles being mutually adapted to generate said predetermined function as a gain/loss characteristic in said HISB device that compensates for said gain/loss characteristic of said second device.

4. The invention of claim 1 wherein said HISB device is designed to operate in conjunction with a second device having a nonlinear refractive index characteristic over a particular wavelength range, said individual gain/loss profiles being mutually adapted to generate said predetermined function such that said HISB device has a nonlinear refractive index characteristic that compensates for said nonlinear refractive index characteristic of said second device.

5. The invention of claim 1 wherein said individual gain/loss profiles are mutually adapted to generate said predetermined function as a relatively flat gain/loss profile over a particular wavelength range.

6. The invention of claim 1 wherein said HISB device comprises a laser for simultaneously operating at a plurality of different wavelengths.

7. The invention of claim 6 further comprising a transmitter that includes said HISB device, a utilization device for receiving radiation at said wavelengths generated by said HISB device, and a transmission medium for optically coupling said transmitter to said receiver.

8. The invention of claim 6 wherein said individual gain/loss profiles are mutually adapted to generate said predetermined gain/loss characteristic as a gain profile that exhibits peaks at a multiplicity of said different wavelengths.

9. The invention of claim 8 wherein said transmitter and said receiver operate on the basis of wavelength division multiplexing of a multiplicity of channels, and radiation at each of said wavelengths emitted by said HISB device correspond to one of said channels. \

10. The invention of claim 1 wherein each of said ISB sub-devices includes a radiative transition region and an injection/relaxation region adjacent thereto.

11. A heterogeneous intersubband (HISB) optical device having a predetermined gain/loss profile, said device comprising

upper and lower cladding regions,

a core region including a multiplicity of intersubband (ISB) active regions stacked between said cladding regions, each of said active regions including a plurality of radiative transition regions and interleaved therewith a plurality of injection/relaxation regions,

means forming an optical cavity resonator, said active regions being located within said resonator, characterized in that

at least two of said active regions are different from one another, said regions having a set of characteristic parameters including the peak energy of the ISB transitions therein, the position of each of said sub-devices in the stack, the oscillator strengths of said transitions, the energy bandwidth of said transitions, the length of said active regions, and the doping levels

of said regions, and wherein said parameters are mutually adapted to generate said predetermined gain/loss profile.